**Algebra 2 Final Exam**

**2016 – 2017**

**Name:**

By signing below, I verify that this work is my own. I have neither given nor received help. I have completed my work within the expectations of the *Washington Latin School* Code of Conduct.

Signature: Date:

**Go to the back page (the “Notes Page”) and fill out your notes.**

**Part 1: Parent Functions**

The parent functions for **linear** and **exponential** functions we have studied this year are listed below.

**Linear Function:** ***y = mx* + *b*** **Exponential Function:** ***y = abx***

1. What letter in the **linear** function represents the **rate of change**? (1pt)
2. What letter in the **exponential** function represents the **rate of change**? (1pt)
3. What letter in the **linear** function represents the **initial value**? (1pt)
4. What letter in the **exponential** function represents the **initial value?** (1pt)
5. A **linear** function changes by a number each time. An   
     
     
   **exponential function** changes by a number each time. (1pt each)

The formulas for a **quadratic function** are below:

**Quadratic Function:** **Vertex Form:** *y = a(x – h)*2 *+ k*

**Factored Form:** *y = a(x – r*1*)(x – r*2*)*

**Standard Form:** *y = ax*2 *+ bx + c*

1. What letter shows the **rate of change** in all of the forms? (1pt)
2. Which form tells you where the **vertex** is? (1pt)

Copy that form here, and show where the vertex is. (2pts)

1. Which form tells you where the **roots/x-intercepts** are? (1pt)

Copy that form here, and show where the roots are. (2pts)

1. What is the formula for finding the vertex in **standard form**? (2pts)

1. What is the **parent pattern** for change in a **quadratic function**? (2pts)

**Part 2: Increasing or Decreasing? and What Kind of Function?**

1. Is each function **increasing** or **decreasing**? (With exponential functions, we often called this “growth” or “decay”.) (2pts each)







1. Determine if each word problem below describes a **linear**, **exponential**, or **quadratic** function. You do not have to write the equation of the function. (3pts each)
2. Mr. Hotchkiss is having a picnic, and the ants want to join him. At the first minute, **1** ant sees the food and walks over. The next minute b ants walk over; then **4** ants; then **8** ants.  
     
     
     
   Is this **linear**, **exponential**, or **quadratic**?

How do you know?

1. Makayla is braiding Kayla B’s hair for her first video shoot. She braids **2** braids every 90 seconds.

Is this **linear**, **exponential**, or **quadratic**?

How do you know?

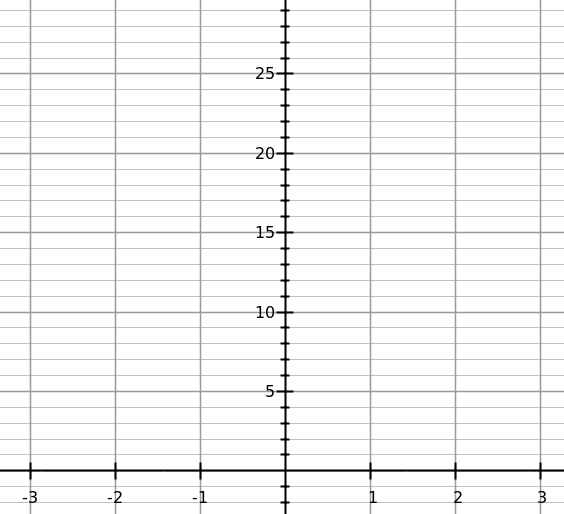
1. Ms. Jost’s plans are growing quickly. The first day they grow **2** inches. The next day they grow **3** inches. The day after that, they grow **6** inches. The following day they grow **11** inches.

Is this **linear**, **exponential**, or **quadratic**?

How do you know?

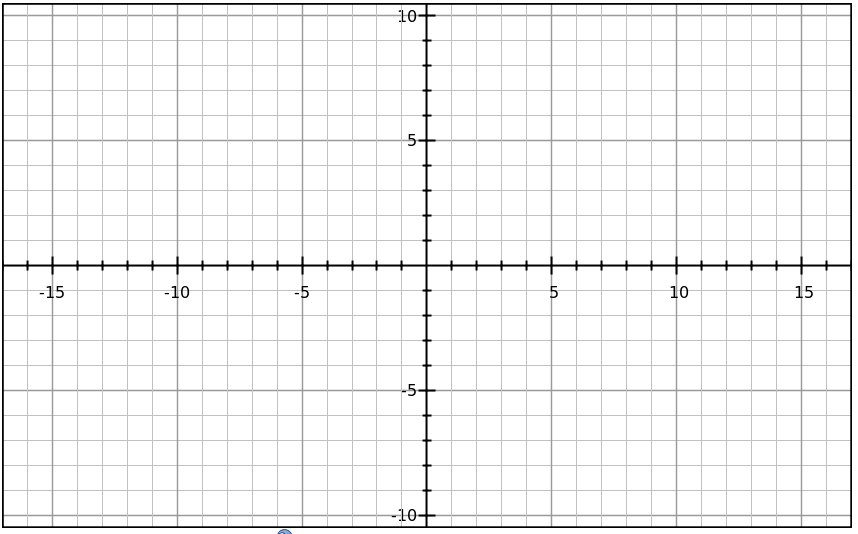
**Part 3: Graphing**

Graph the following functions. Use the input-output table to help.

1. Equation:   
    **Circle one:** linear exponential quadratic **How do you know?** (3pts)  
     
    **Input-Output table** (2pts)

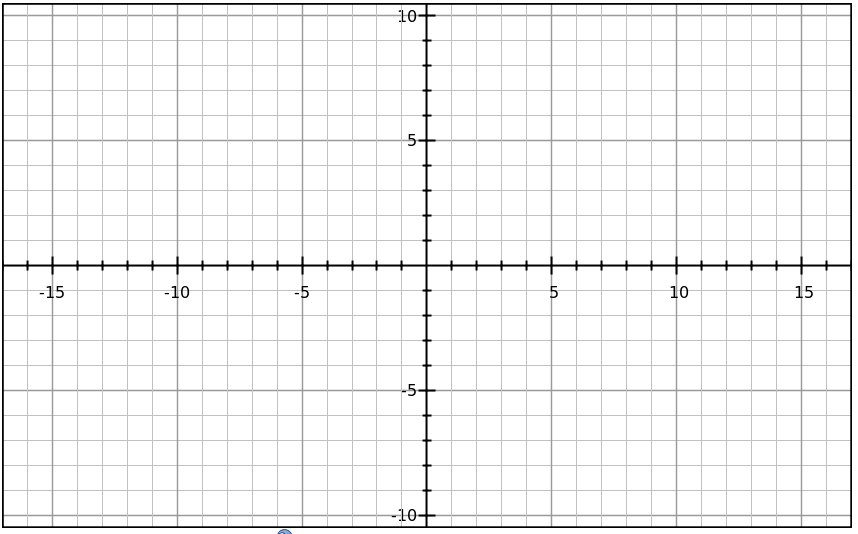
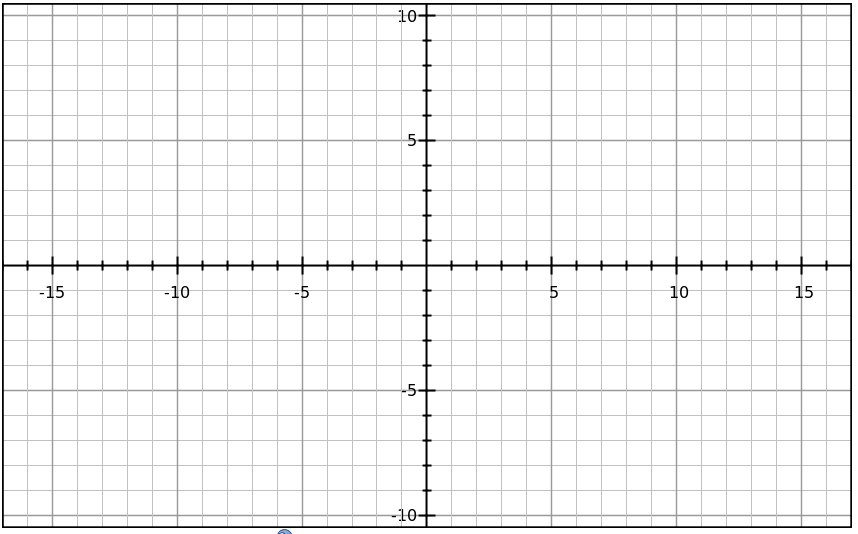
|  |  |
| --- | --- |
| **x** | **f(x)** |
| **-3** |  |
| **-2** |  |
| **-1** |  |
| **0** |  |
| **1** |  |
| **2** |  |
| **3** |  |

(4pts)

1. **** Equation:   
     
   **Circle one:** linear exponential quadratic **How do you know?** (3pts)  
     
     **Input-Output table** (2pts)   
    (4pts)

|  |  |
| --- | --- |
| **x** | **f(x)** |
| **-3** |  |
| **-2** |  |
| **-1** |  |
| **0** |  |
| **1** |  |
| **2** |  |
| **3** |  |

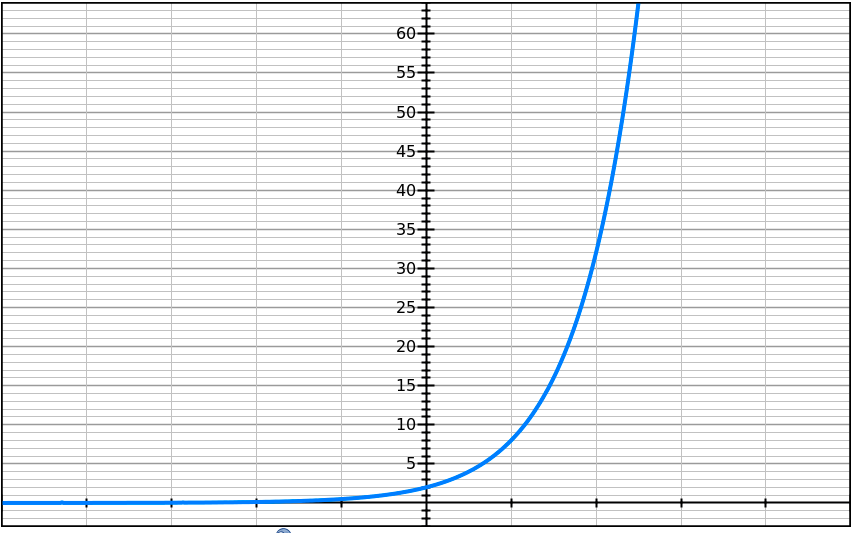
|  |  |
| --- | --- |
| **x** | **f(x)** |
| **-3** |  |
| **-2** |  |
| **-1** |  |
| **0** |  |
| **1** |  |
| **2** |  |
| **3** |  |

1. ****Equation:   
    **Circle one:** linear exponential quadratic **How do you know?** (3pts) (4pts)  
     
    **Input-Output table** (2pts)
2. ****Equation:   
    **Circle one:** linear exponential quadratic **How do you know?** (3pts) (4pts)  
     
    **Input-Output table** (2pts)

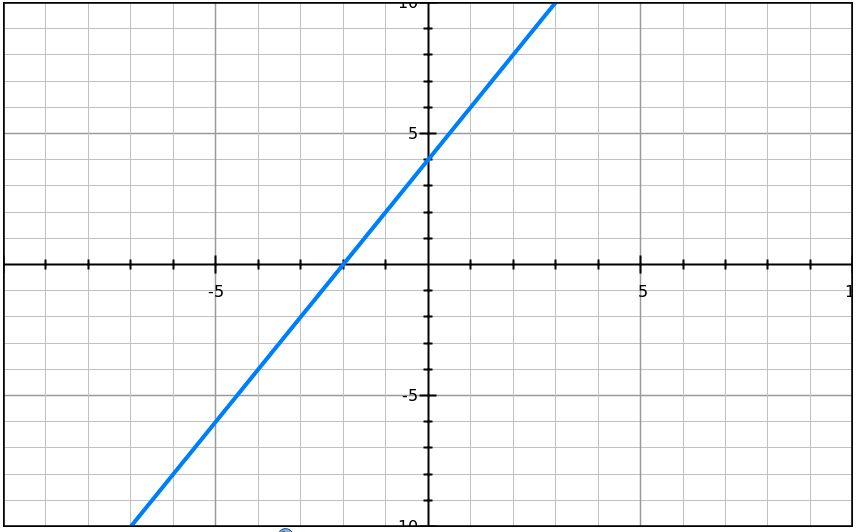
|  |  |
| --- | --- |
| **x** | **f(x)** |
| **-3** |  |
| **-2** |  |
| **-1** |  |
| **0** |  |
| **1** |  |
| **2** |  |
| **3** |  |

**Part 4: Writing Equations from Graphs**

**Circle one:** linear exponential quadratic **How do you know?** (3pts)

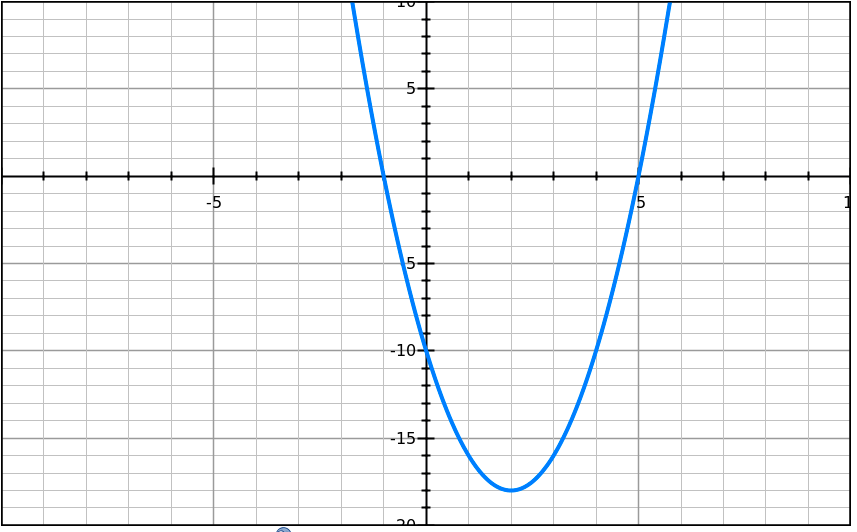
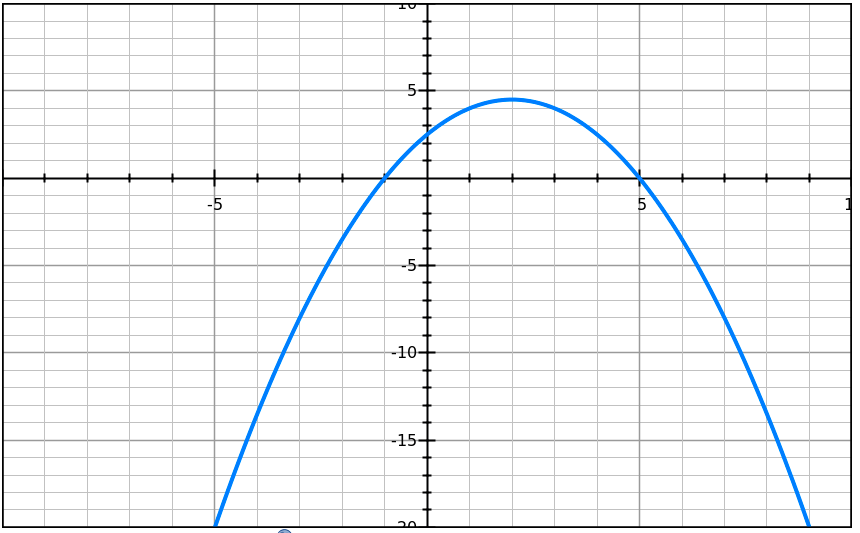
****

**Initial value**: (2pts)  
**Growth rate**: (2pts)  
**Equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** (3pts)

1. **Circle one:** linear exponential quadratic **How do you know?** (3pts)   
   

**Initial value**: (2pts)  
**Growth rate**: (2pts)

**Equation:** (3pts)

1. Write the equation in **both vertex and factored forms** shown by the following graphs of quadratic functions. (3 points each per equation)
   1.   
        
        
        
      **Factored Form:   
        
        
      Vertex Form:**
   2.   
        
        
        
      **Factored Form:   
        
        
      Vertex Form:**

**Part 5: Writing Equations from Tables and Descriptions**

1. Write the equation for each table below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***x*** | 0 | 1 | 2 | 3 | 4 |
| ***y*** | 2 | 8 | 32 | 128 | 512 |

**Circle One:** Linear or Exponential? (2pts)  **Initial value**: (2pts)  
 **Growth rate**: (2pts)  
 **Equation:** (4pts)

|  |  |  |  |
| --- | --- | --- | --- |
| **Step 0** | **Step 1** | **Step 2** | **Step 3** |
|  |  |  |  |

**Circle One:** Linear or Exponential? (2pts)  **Initial value**: (2pts)  
 **Growth rate**: (2pts)  
 **Equation:** (4pts)

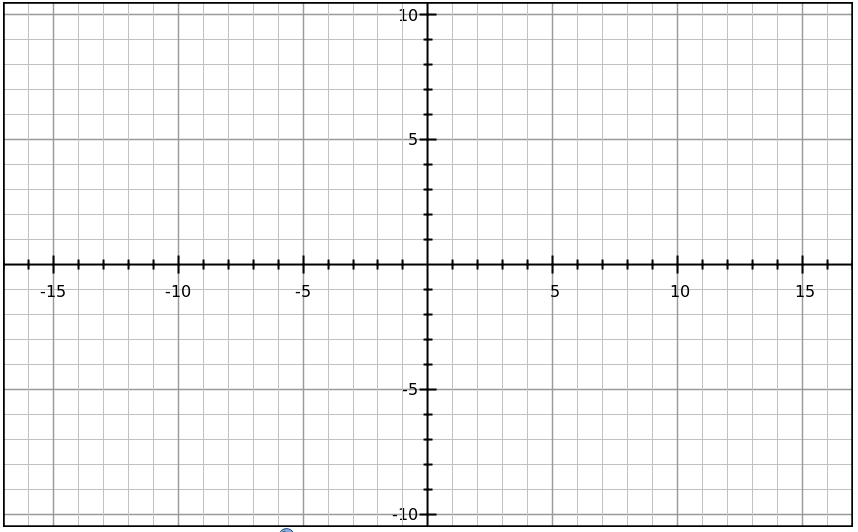
1. A line that passes through the points (2, 7) and (-6, 23)

**Circle One:** Linear or Exponential? (2pts)  **Initial value**: (2pts)  
 **Growth rate**: (2pts)  
 **Equation:** (4pts)

**Part 6: Parallel & Perpendicular Lines:**

Parallel lines have (2pts) slope and (2pts)   
y-intercepts.

Perpendicular lines have (2pts) slopes.

1. Write the equation of a line that passes through the points (1, 5) and (5, 3). (3pts)
2. Graph that line below (3pts)  
   
3. Write the equation of a line that is **parallel** to the line above and contains the point   
   (6, 20). (3 points)
4. Write the equation of the line that is **perpendicular** to the line above and contains the point  
   (12, 10). (3 points)

**Part 6: Solving Equations (with Quadratic Functions)**

Solve each of the following equations: (3 points each)

1. 0.5(*x* – 4)2 – 8 = 0
2. (*x* – 3)(*x* + 7) = 0
3. *x*2 – 12*x* – 28 = 0

**NOTES:**

**Linear Function:** y = mx + b

Circle the rate of change/slope. Underline the y-intercept/initial value

In this function, do you add or multiply?

In this function, do you add the *same amount* or a *different amount* each time?

**Parallel and Perpendicular Lines:**

Do parallel lines have the same slope or different slopes?

Do parallel lines have the same y-intercepts or different y-intercepts?

Perpendicular lines have **opposite reciprocal** slopes.

Examples of opposites are: 2 & -2

4 & -4

Examples of reciprocals are: 2 & ½

4 & ¼

Examples of **opposite reciprocals** are: 2 & -½

4 & -¼

Write the **opposite reciprocal** of 5

**Exponential Function:** y = abx

Circle the rate of change. Underline the y-intercept/initial value

In this function, do you add or multiply?

In this function, do you multiply by the *same amount* or a *different amount* each time?

**Quadratic Function:**

In this function, do you add or multiply?

In this function, do you multiply by the *same amount* or a *different amount* each time?

Write the **parent pattern:**

From the vertex, go. . .

**Standard Form:** y = ax2 + bx + c

Circle the rate of change. Underline the y-intercept/initial value

**Vertex Form:** y = a(x – h)2 + k

Circle the rate of change. Draw arrows to the vertex.

**Factored Form:** y = a(x – r1)(x – r2)

Circle the rate of change. Draw arrows to the roots/x-intercepts.

**Extra notes go here:**